U. S. Branch Mint
New Orleans, April 1st 1857.

Dear Sir,

Your favour of the 22d ultmo was duly received, and I will give you a concise description of my manner of working, when I experimented upon the McCulloh process, at the request of the inventor, and which resulted in refining gold of unexceptionable quality, toughened by simply melting with the usual quantity of flux (bi tart & nitre, equal parts) in a black lead pot. Long before I heard of any new method of refining, I tried experiments with a view to avoid the use of silver, the want of which has always been a source of uneasiness and apprehension to me. I alloyed gold with lead and separated it with nitric acid, and I also tried to dissolve the argentiferous gold in nitro-muriatic acid. My results were unsatisfactory. When the McCulloh process and your own became known to me, I was anxious to try them. I made several unsuccessful experiments with the M.C. process on a small scale (an ounce or two), which I attributed to the imperfection of the granulation

and which induced me to repeat the experiments on larger quantities (20–30 ounces), and to pay particular attention to the granulating. Four lots of gold were alloyed with 2½ & 3½ parts of zinc and granulated. The alloy was separated and toughened in sand-crucibles at one melting. A good while after, having mentioned the success of the four above mentioned experiments to Mr. McC., I was requested by him to try his process on a large scale; I did so: I alloyed two thousand ounces of gold with zinc; making four granulation melts of the lot, one of which I regarded as imperfect, and worked them off in a manner nearly the same as that in which I worked the small lots, and failed in every attempt to toughen the gold. I should mention that among many other fluxes I employed sal. ammoniac, phosphate of soda & ammonia, and finally added a reasonable quantity of copper, incorporating it with the gold at the highest possible temperature of my furnace and added repeated doses of nitre and borax. But after a long continued assaying with nitre, the gold remained the same, and if possible more brittle than before. I was nearly

hydrochloric acid; I neutralized the liquid with ammonia, and tested for zinc with NH_4S. Upon the first trial the liquid contained a considerable quantity of silver & zinc; I continued the boiling of the bottles in the salt water bath, until I could no longer find any zinc by the above mentioned plan, when I decanted, & washed the gold. The gold had a most beautiful appearance. After drying I incorporated it well with about one half of its volume of coarsely pulverized nitre and borax, and melted it down in the usual way, when it was found to be tough and of 995 ths fine.

My apparatus for working with the nitric acid is not well suited on account of the difficulty and risk of stirring up glass matrasses, which is essential to insure the complete abstraction of the zinc, the smallest trace of which will render the gold brittle. If I remember rightly, yourself or some of your men told me that you always added copper to the fine gold to toughen it the more readily; in some of my unsuccessfull operations with the McC. process, I tried it, but it was of

no use. From the publication of Mr. McCulloh I see that the ^suggestion of the^ use of muriatic acid is disclaimed by yourself & Mr. McC. I think the suggestion came from me. I have frequently used it with the most beneficial results. In separating base bars by the [illegible] quartz process I have occasionally met with a very fine, light, dark-coloured powder mixed with the gold, and giving to the whole of the gold the same dark appearance; the presence of this dark powder (which may be a combination of gold with tin) renders the filtering, i.e. the edulcoration on a filter, very laborious and imperfect. — In such a case it has been and is now my practice, to wash the gold ~~dry~~ ~~[illegible]~~ by affusion and decantation, allowing the ~~[illegible]~~ to deposit the fine powder, and heating the dark coloured gold with muriatic acid, which decomposes this dark powder which is unalterable in NO_5, and ~~[illegible]~~ gives the gold immediately a beautiful colour, and insures its toughness. Before I employed muriatic acid, I always encountered difficulty in toughening the gold obtained by separating jewellers bars & the like, but the use of muriatic acid removes all difficulties. I think I mentioned this to Mr. Morrell, when in your mint.

I cannot tell you what the [illegible] loss was on my experiments, as I did not institute them with a view to ascertain the economical value of the process, but merely try how it would work; knowing that experiments were being made at the parent mint, and that of course, a change from the present method of refining would only be ordered by the director, after a series of satisfactory experiments I contented myself with becoming familiar with the particulars of the process, in order to work with it more successfully, should its adoption be ordered by the director.

With regard to the tin, I have not learnt any-thing further, except that I was told that the same was also found somewhere in Arkansas, that the region where it occurred, had been explored, but that the explorers had not been able to find its locality. I first heard of tin coming from the interior of Mississippi, & that it was brought down the Tangipahoa river to lake Pontchartrain by Indians, and I received a sample, some 4 years ago, as coming from that source. I have made some enquiries of persons employed in lake

navigation, but could not learn any thing from them. — If I should succeed to find out its locality, I will let you know with pleasure. —

Please give my respects to Major Patterson, Peale & Eckfeldt.

Yours very truly

M. F. Bonzano

To Professor J. C. Booth
Philadelphia.

April 14th 1851
M. F. Bonzano
New Orleans
La.

discouraged, but tried the process again on a lot of 800 ounces, and succeeded perfectly. I will now point out to you, what I deem essential to success: In granulating, the greatest possible care is required, (the first granulations I made, were heavy round shot, they retained their original form after the action of the sulphuric and nitric acids, and the gold could not be toughened on account of its retaining zinc), and I think that much depends upon the quality of the zinc employed, the absence of tin & lead; the former especially, being an indispensable condition. The alloying is best done by melting the gold and zinc separately, and pouring the former into the latter while constantly stirring. The metal should not be poured before it has cooled down below a red heat, at least the metal should not appear red-hot in the day-time. The granulated mass will then be very light. Unless the granulation is perfect, it is of no use to attempt toughening the gold. For working the granulated metal in the acid I used a large copper pan 6 ft. in diam. & 18 in. high, mounted on 3 iron posts so as to allow of small furnaces being placed under it. I filled the pan with water and added the sulphuric acid, until the

effervescence became very lively, and adding more
acid when it became dry as. I dispersed partially the
very disagreable hydrogen gas, by setting fire to
it. — After a couple of hours the granulated
metal was reduced to a powder; the pot of
pulph. water was drawn off, the powder disin-
tegrated still further by rubbing it with a
wooden spatula. The pan was again filled
with hot water, and added, and heat applied
by means of 3 little portable furnaces, such as I use
for drying the reduced silver. — After an
hour or so I decanted the liquid, washed
the gold with hot water, and transferred
it to 12 glass matrasses. I now put
on a reasonable quantity of nitric acid
and applied heat by means of a salt-water
bath. — Some two hours after the addition
of the nitric acid I examined the bottles
and found, that the nitric acid had not
permeated through the entire mass of the
gold, but only acted upon its surface.
The powder was packed so densely that the
upper portion only was acted upon to a
depth of about an inch, which was very
apparent from the difference in colour. I
therefore stirred the bottles repeatedly until
I considered that the whole mass had been
uniformly acted upon, when I took out
a portion, rubbed it well in a mortar,
transferred it to a small porcelain basin,
boiled it with strong nitric acid, & decanted
the liquid for the purpose of ascertaining whether
the acid had dissolved out any thing more.
The liquid contained silver which I put into